

WHAT IS CLAIMED IS:

1. A method for compounding gel-free injection molding feed stock for injection molding net-shape ceramic parts, comprising the steps of:

- a) mixing inorganic particles with non-gel forming water soluble organic binders having molecular weight between 1000 and 1,000,000 and that are between 0.5 weight % and 10 weight % based upon the inorganic particles, along with plasticizers, water and processing aids in a mixer to form a mixture, wherein the non-gel forming water soluble organic binders are composed of high and low molecular weight organic binders, and wherein a weight fraction of the high molecular weight organic binders with respect to the low molecular weight organic binders varies between 0.1 and 0.6;
- b) compounding the mixed inorganic particles and the non-gel forming water soluble organic binders at a high temperature in the range of between 70° and 98° Centigrade, under shear force, to form a homogenous viscous slurry in the range of 5×10^3 and 7×10^4 Pa.sec at a shear rate of 10 sec^{-1} ;
- c) cooling the homogenous viscous slurry to room temperature to form a compounded solid mass;
- d) grinding the compounded solid mass to small pellets to provide feed stock for an injection molding machine;
- e) injection molding the feedstock to produce a green component for subsequent drying; and
- f) sintering to form a net-shape final ceramic part.

2. The method claimed in claim 1, wherein the inorganic particles are Y-TZP ceramic comprising 3 mole % yttria, and have an average particle size ranging from 0.2 to 0.5 μm .

3. The method claimed in claim 1, wherein the inorganic particles are ceramic composite alumina-toughened zirconia, comprising between 5% to 49% by weight of alumina, and have average particle size ranging from 0.2 to 1.0 μm .

4. The method claimed in claim 1, wherein the inorganic oxides comprises between about 45% to 90% by weight of the compounded

5. The method claimed in claim 1, further comprising the step of heating the water soluble organic binders, plasticizers and water to a temperature of between 90-98°C prior to adding the inorganic particles, and then heating the mixture to a temperature to a range of between 70-90°C after adding the inorganic particles and mixing for more than 4 hours in a shear mixer.

6. An injection molded net shape product made by the process

7. An injection molding process, comprising the steps of:

a) mixing ceramic powders with non-gel forming water soluble binders having a molecular weight distribution between 1000 and 100,000, wherein the non-gel forming water soluble organic binders are a mixture of high and low molecular weight organic binders, and wherein a ratio of the high molecular weight organic binders with respect to the low molecular weight organic binders varies between 0.1 and 0.6;

b) compounding the mixed ceramic powders at high the range of between 70° and 98° Centigrade ,under shear force, to enous viscous slurry in the range of 5×10^3 and 7×10^4 Pa.sec at a 10 sec^{-1} ;

c) cooling the homogenous viscous slurry to room temperature

d) grinding the compounded solid mass to small pellets to stock for an injection molding machine; and

e) injection molding the feedstock to produce a green subsequent drying.

8. The process claimed in claim 7, wherein the ceramic Y-TZP ceramic comprising 3 mole % yttria, and have an average grain size ranging from 0.2 to 0.5 μm .

9. The process claimed in claim 7, wherein the ceramic composite alumina-toughened zirconia, comprising between 10 to 90 weight % of alumina, and have average particle size ranging from 0.2 to 10 micrometers.

10. The process claimed in claim 7, wherein the ceramic
rise between about 45% to 90% by weight of the compounded

11. The process claimed in claim 7, further comprising the step of heating the non-gel forming water soluble organic binders, the water to a temperature between 90 and 98°C prior to adding the ceramic powders, and decreasing the temperature to a range of between 70-90°C and mixing for more than 4 hours in a shear mixer.

12. The process of claim 7, wherein the non-gel forming water binders include primary binders poly(ethylene oxide), polyvinylpyrrolidone, polyacrylic acid, polyacrylamide, polyvinylpyrrolidone sulfonate and its derivatives, hydroxypropyl cellulose, methylcellulose, methyl methacrylate, methyl methacrylate anhydride copolymer, poly (ethylene glycol) or a mixture

13. The process of claim 7, wherein the non-gel forming water binders are between 3% and 8% by weight of the ceramic

14. The process of claim 7, wherein the water in the mixture is between 30% and 50% by weight of the mixture, and preferably between 35% and 45% by weight of the mixture.

15. The process of claim 7 wherein the homogenous viscous slurry is obtained between 4 and 12 hours.

16. The method claimed in claim 1, wherein the homogenous viscous slurry is obtained between 4 and 12 hours.

17. The method claimed in claim 1, wherein the water in the mixture is between 30% and 50% by weight of the mixture, and preferably between 35% and 45% by weight of the mixture.

18. The method claimed in claim 1, wherein the non-gel forming water soluble organic binders are between 3% and 8% by weight of the inorganic particles.

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